



CATHEXIS

INNOVATIONS INC.

RFID MADE EASY

Superior Waterproof Coatings Data Acquisition System Description

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Overview

This document will provide an overview of the system used to collect temperature and humidity data from two installations of Superior Waterproof Coating's foundation coating system in Gander, NL between November 2003 and January 2005.

This system was designed and implemented by Cathexis Innovations Inc (henceforth Cathexis), based on feature specifications from Superior Waterproof Coatings (henceforth SWC), and feedback from the National Research Council of Canada.

Purpose

The purpose of this system was to collect, archive, and make available through the Internet a collection of temperature and humidity data collected from the two install locations in Gander, NL.

Through a collection of data sensors (thermocouples, humidity probes and heat flux transducers), data acquisition systems (National Instruments FieldPoint systems), and software developed by Cathexis (FieldPoint firmware, and a hosted web site application) this information was collected and made available by Cathexis to SWC and select other parties as designated by SWC.

Architecture

A high level architectural diagram of the implemented system can be seen below. It consisted of three primary aspects:

1. Remote data collection (at the houses in Gander)
2. Data retrieval (by Cathexis staff)
3. Data viewing (through the Cathexis web site)

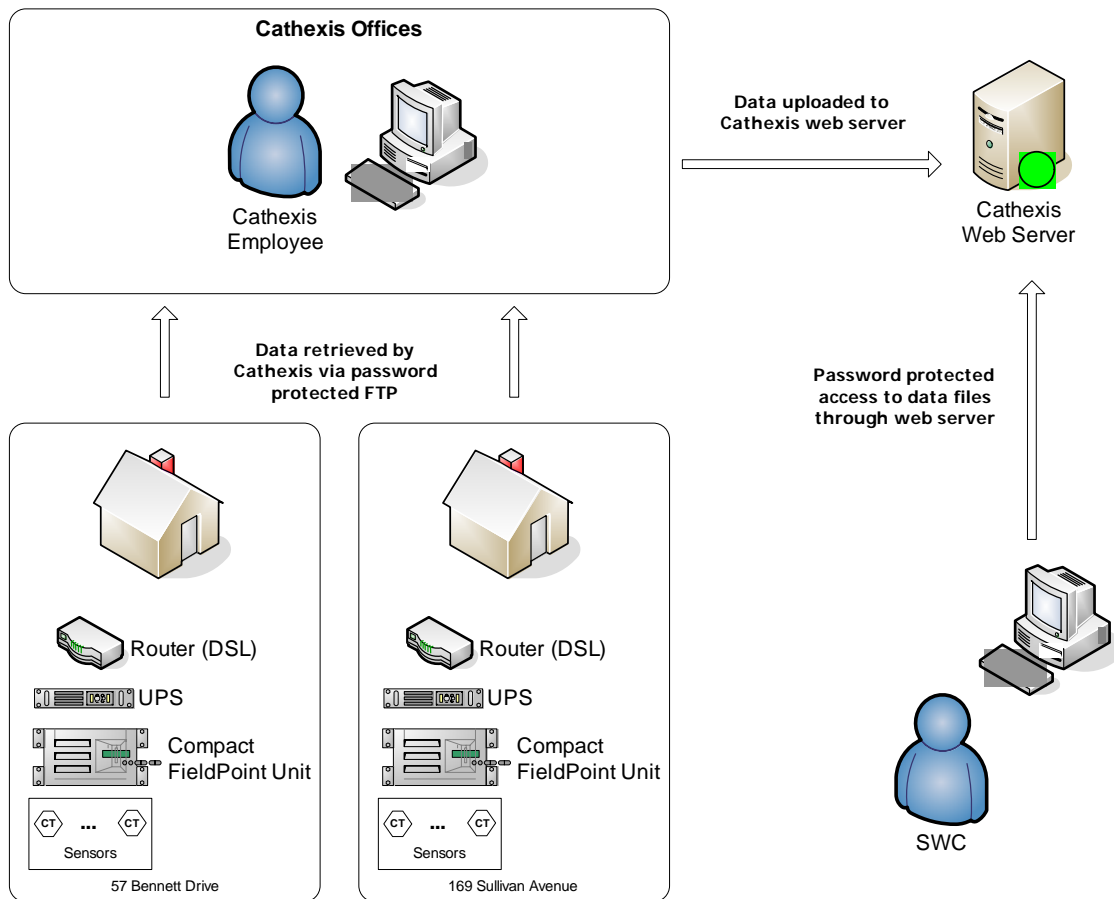


Figure 1: High Level Architecture

Data Collection

The FieldPoint units in each house periodically collected data from the attached sensors, using an application written in National Instruments LabView 7, using the Real-Time LabView extension. The application used LabView libraries and the capabilities of the NI Compact FieldPoint hardware to convert the raw sensor data into information.

This information was written out to a .CSV file stored in the flash memory of the FieldPoint units.

The FieldPoints units hosted a password protected FTP server which gave Cathexis personnel remote access to the .CSV data files. Internet access was provided through an Aliant DSL connection through a DLink (later Linksys) router.

Data retrieval

Periodically, Cathexis personnel would use a custom-written FTP client application to retrieve the .CSV files from the FieldPoint units. This application created an FTP connection over the Internet (through the in-house router) to each unit, retrieved saved data files, and deleted any retrieved information.

These data files would then be archived on an internal Cathexis server before being posted to the external data access site.

Data viewing

Access to the data was granted through the external SWC project web site, as hosted by Cathexis. External users to whom a password had been granted (as directed by SWC) could log into this site, view the requisite information about the sensor configuration for each house and download new and archived data files.

Data Collection Equipment

The National Instruments Compact FieldPoint devices were chosen for the capacity, flexibility and reliability. The two tables below outline the module configuration for each device.

Module	Quantity	Description	Calibrated by
NI cFP-BP-8	1	Compact FieldPoint 8-module backplane.	National Instruments
NI cFP-TC-120	3	8-Channel Thermocouple Input Module for Compact FieldPoint	National Instruments
NI cFP-AI-110	1	8-Channel Analog Voltage and Current Input Module for Compact FieldPoint	National Instruments

Table 1: CompactFieldPoint Configuration for 57 Bennett

Module	Quantity	Description	Calibrated by
NI cFP-BP-8	1	Compact FieldPoint 8-module backplane.	National Instruments
NI cFP-TC-120	4	8-Channel Thermocouple Input Module for Compact FieldPoint	National Instruments
NI cFP-AI-110	1	8-Channel Analog Voltage and Current Input Module for Compact FieldPoint	National Instruments

Table 1: CompactFieldPoint Configuration for 169 Sullivan

Sensors

The tables below detail the sensors used to record data at the two locations. All sensors were vendor/reseller calibrated, except for the thermocouples.

All data acquisition equipment and the wall mount humidity sensor have been calibrated against NIST-certified references. The thermocouples have been verified against NIST-calibrated equipment to perform within equipment tolerances (the error bounds of the cFP-TC-120).

Module	Quantity	Description	Calibrated by
JLC International EE06-FT1A6-K300	1	Humidity / Temperature Transmitter (for measuring temperature and humidity inside the wall)	JLC International
Vaisala HMD/W70	1	Humidity / Temperature Transmitter (Wall-mount)	Vaisala
Graham Sensor Tech. GST03340-T-120	5	10 ft. Armoured Type-T thermocouple	Cathexis
Graham Sensor Tech. GST03340-T-180	3	15 ft. Armoured Type-T thermocouple	Cathexis
Graham Sensor Tech. GST03340-T-240	5	20 ft. Armoured Type-T thermocouple	Cathexis
Vatell Corporation BF-03	3	Heat Flux Transducer with integrated Thermocouple	Vatell Corp.

Table 4: CompactFieldPoint Configuration for 57 Bennett Dr.

Module	Quantity	Description	Calibrated by
JLC International EE06-FT1A6-K300	1	Humidity / Temperature Transmitter (for measuring temperature and humidity inside the wall)	JLC International
Vaisala HMD/W70	1	Humidity / Temperature Transmitter (Wall-mount)	Vaisala
Graham Sensor Tech. GST03340-T-120	5	10 ft. Armoured Type-T thermocouple	Cathexis
Graham Sensor Tech. GST03340-T-180	3	15 ft. Armoured Type-T thermocouple	Cathexis
Graham Sensor Tech. GST03340-T-240	5	20 ft. Armoured Type-T thermocouple	Cathexis
Graham Sensor Tech. GST03340 (65')	4	65 ft. . Armoured Type-T thermocouple	Cathexis
Vatell Corporation BF-03	3	Heat Flux Transducer with integrated Thermocouple	Vatell Corp.

Table 4: CompactFieldPoint Configuration for 169 Sullivan

Sensor Installation

The figures in this section detail how the sensors were arranged in each house. For a description of the sensor type and placement, please the accompanying table.

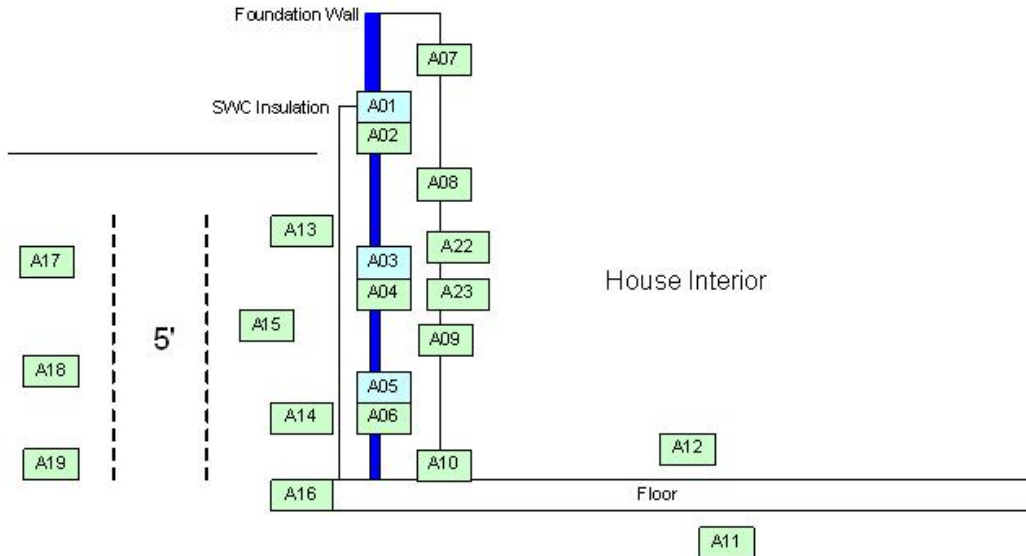


Figure 1: 57 Bennett Drive

<i>Sensor Code</i>	<i>Installation Location</i>
A01	Code blue wall, upper
A02	Code blue wall, upper
A03	Code blue wall, middle
A04	Code blue wall, middle
A05	Code blue wall, lower
A06	Code blue wall, lower
A07	Inner wall, uppermost
A08	Inner wall, upper middle
A09	Inner wall, lower middle
A10	Inner wall, lower
A11	Top of Floor, Inner
A12	Bottom of Floor, Inner
A13	Outer wall, uppermost
A14	Outer wall, upper middle
A15	Outer wall, lower middle
A16	Outer wall, lower most
A17	Ground, upper
A18	Ground, middle
A19	Ground, lower
A20	Wall Humidity, Temperature
A21	Wall Humidity, %RH
A22	Concrete Humidity, Temp
A23	Concrete Humidity, %RH

Figure 2: Sensor Description (Bennett Dr.)

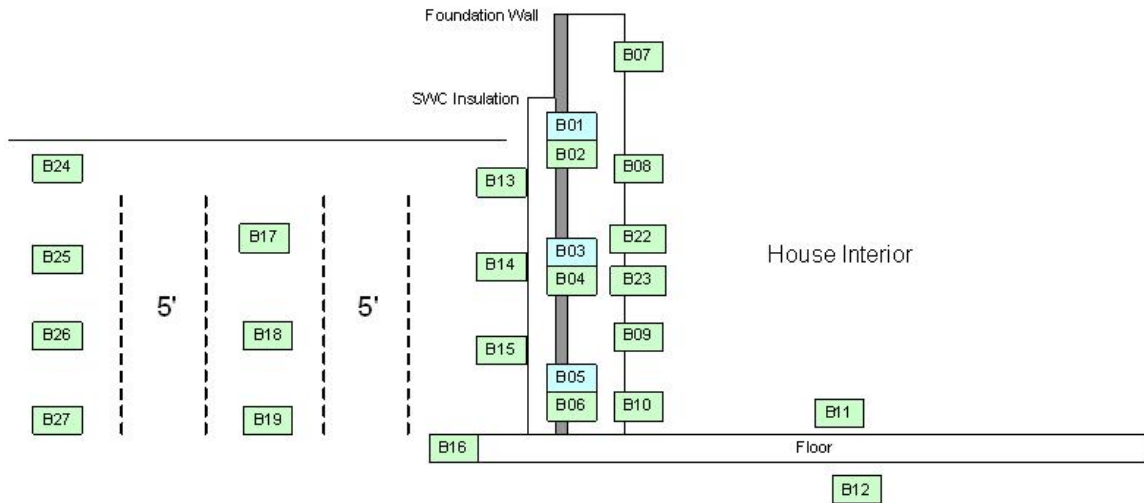


Figure 3: 169 Sullivan Avenue

Sensor Code	DAQ Channel	Type	Installation Location
B01	B3-1	HFT-H	Code blue wall, upper
B02	B2-1	HFT-T	Code blue wall, upper
B03	B3-2	HFT-H	Code blue wall, middle
B04	B2-2	HFT-T	Code blue wall, middle
B05	B3-3	HFT-H	Code blue wall, lower
B06	B2-3	HFT-T	Code blue wall, lower
B07	B1-1	TI10	Inner wall, uppermost
B08	B1-2	TI10	Inner wall, upper middle
B09	B1-3	TI10	Inner wall, lower middle
B10	B1-4	TI15	Inner wall, lower
B11	B1-5	TI20	Inner, upper floor
B12	B1-6	TO20	Inner, below floor
B13	B2-4	TO10	Outer wall, uppermost
B14	B2-5	TO10	Outer wall, upper middle
B15	B2-6	TO15	Outer wall, lower middle
B16	B2-7	TO15	Outer wall, lower most
B17	B1-7	TO20	Ground, upper
B18	B1-8	TO20	Ground, middle
B19	B2-8	TO20	Ground, lower
B20	B3-4	WH-T	Wall Humidity, Temperature
B21	B3-5	WH-H	Wall Humidity, %RH
B22	B3-6	CH-T	Concrete Humidity, Humidity
B23	B3-7	CH-H	Concrete Humidity, Temp
B24	B4-1	TO65	Far ground, upper
B25	B4-2	TO65	Far ground, upper middle
B26	B4-3	TO65	Far ground, lower middle
B27	B4-4	TO65	Far ground, lower middle

Figure 4: Sensor Description (Sullivan Avenue)

Conclusions

The overall system performed quite well, allowing a large amount of data to be collected from multiple remote locations over the course of more than a year. There are certain gaps in the data owing to power and network connectivity issues arising from the installation of equipment in a residential locale. This, however, does not affect the integrity and validity of the collected data.

If there are any questions regarding this system, or the data collected, please contact Cathexis via:

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